

Lightweight, Wearable Metal Rubber-Textile Sensor for In Situ Lunar Autonomous Health Monitoring, Phase I

Completed Technology Project (2007 - 2007)



Project Introduction

NanoSonic proposes to develop a low-weight, non-invasive in situ autonomous health-monitoring system for crewmembers' lunar extravehicular activity (EVA). This novel sensor technology aims at monitoring health status to improve comfort and efficiency of astronaut as well as to eliminate catastrophic failure to the individual and mission. The sensor system would consist of a fully-interconnected, non-invasive, and wearable Metal Rubber

TM

-Textile sensor, which would be worn underneath the protective spacesuit (outer-vehicular wear) and/or can also be integrated into the inner lining of suits worn inside NASA exploratory lunar vehicles. The comfortable, durable, and low mass density fabric sensor network would be developed via Metal Rubber(TM) technology and nanostructured materials for mapping crewmembers' health status via advanced intrinsic physiological monitoring. Metal Rubber

TM

is fabricated as a conformal coating or free-standing material via layer-by-layer, molecular self-assembly, which enables thickness and placement control over multiple constituents for true nanostructured multifunctionality; while advanced polymers have allowed scale-up to free-standing materials (several mm thick). Metal Rubber

TM

requires less than 0.03 volume % of metal, allowing the manufacturing a cost effective, low-weight material. NanoSonic's proposed health-monitoring system would address monitoring the astronauts' metabolic rate, heart rate, electrocardiogram (ECG), and body temperature for both EVA and intra-vehicular activities.

Anticipated Benefits

Potential NASA Commercial Applications: Metal Rubber

TM

and Metal Rubber

TM

-Textiles can be used as replacements for conventional metallic wire sensors, heavy and bulky antenna components, and as a replacement for tin-lead solder for the mechanical, electrical and thermal interconnection of electronic and mechanical components. Metal Rubber

TM

-Textile materials may also be used in high performance, highly flexible and mechanically robust wearable sensor systems, electronic flex circuits,



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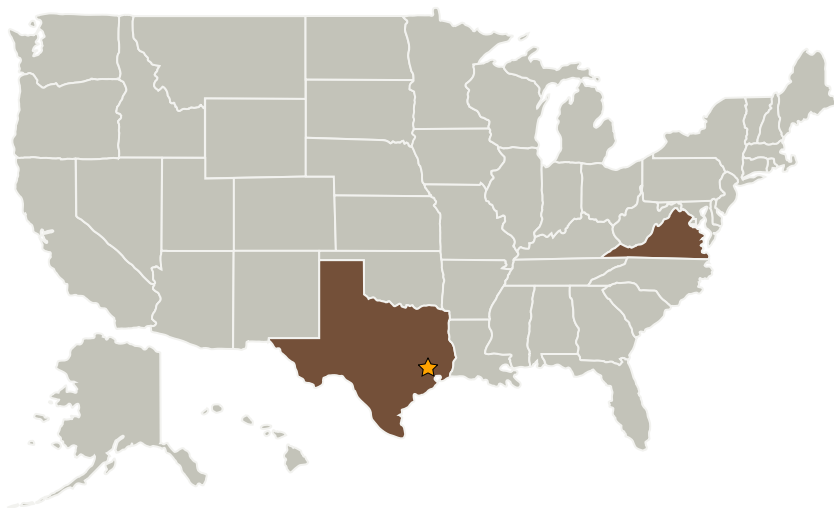
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antennas, flexible displays and smart electronic fabrics.

Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|-------------------------------|-------------------------|-------------|--------------------|
| ★ Johnson Space Center(JSC) | Lead Organization | NASA Center | Houston, Texas |
| Nanosonic, Inc. | Supporting Organization | Industry | Pembroke, Virginia |

Primary U.S. Work Locations

| | |
|-------|----------|
| Texas | Virginia |
|-------|----------|

Project Transitions

January 2007: Project Start

July 2007: Closed out

Closeout Summary: Lightweight, Wearable Metal Rubber-Textile Sensor for In Situ Lunar Autonomous Health Monitoring, Phase I Project Image

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Andrea J Hill

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - ↳ TX06.3 Human Health and Performance
 - ↳ TX06.3.4 Contact-less / Wearable Human Health and Performance Monitoring